Grade 2
Science
Item Specifications

Missouri
DEPARTMENT OF ELEMENTARY & SECONDARY
EDUCATION

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Introduction

In 2014 Missouri legislators passed House Bill 1490, mandating the development of the Missouri Learning Expectations. In April of 2016, these Missouri Learning Expectations were adopted by the State Board of Education. Groups of Missouri educators from across the state collaborated to create the documents necessary to support the implementation of these expectations.

One of the documents developed is the item specification document, which includes all Missouri grade level/course expectations arranged by domains/strands. It defines what could be measured on a variety of assessments. The document serves as the foundation of the assessment development process.

Although teachers may use this document to provide clarity to the expectations, these specifications are intended for summative, benchmark, and large-scale assessment purposes.

Components of the item specifications include:

Expectation Unwrapped breaks down a list of clearly delineated content and skills the students are expected to know and be able to do upon mastery of the Expectation.

Depth of Knowledge (DOK) Ceiling indicates the highest level of cognitive complexity that would typically be assessed on a large scale assessment. The DOK ceiling is not intended to limit the complexity one might reach in classroom instruction.

Item Format indicates the types of test questions used in large scale assessment. For each expectation, the item format specifies the type best suited for that particular expectation.

Content Limits/Assessment Boundaries are parameters that item writers should consider when developing a large scale assessment. For example, some expectations should not be assessed on a large scale assessment but are better suited for local assessment.

Sample stems are examples that address the specific elements of each expectation and address varying DOK levels. The sample stems provided in this document are in no way intended to limit the depth and breadth of possible item stems. The expectation should be assessed in a variety of ways.

Possible Evidence indicates observable methods in which a student can show understanding of the expectations.

Stimulus Materials defines types of stimulus materials that can be used in the item stems.

Grade 2 SCIENCE

Physical Sciences	2.PS1.A.1
Core Idea	**Matter and Its Interactions**
Component	**Structure and Properties of Matter**
MLS	Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

Expectation Unwrapped

[Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.]

SCIENCE AND ENGINEERING PRACTICES

Plan and Conduct an Investigation

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.

DISCIPLINARY CORE IDEAS

Structures and Properties of Matter

- Classify different kinds of materials by their observable properties
- Different properties are suited to different purposes.
- Which materials will be observed at different temperature, and how those temperatures will be determined (e.g., using ice to cool and a lamp to warm) and measured (e.g., qualitatively or quantitatively).

CROSSCUTTING CONCEPTS

Patterns

- To describe and classify
- Patterns in the natural and human designed world can be observed

DOK Ceiling

3

Item Format

Selected Response
Constructed Response
Technology Enhanced

Content Limits/Assessment Boundaries

- Tasks should avoid phase change and molecular-level activity
- Tasks should avoid molecule arrangement

Sample Stems

Grade 2 SCIENCE

Possible Evidence • Students develop an investigation to classify different kinds of materials (e.g., metals, rocks, wood, soil, powders) • Students identify how properties of materials will be determined and classified • Students collect and record data on the properties of the materials. • Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.	
Stimulus Materials Graphic organizers, diagrams, graphs, data tables, drawings	

Grade 2 SCIENCE

<table>
<tr><th colspan="2">Physical Sciences</th><th>2.PS1.A.2</th></tr>
<tr><td>Core Idea
Component
MLS</td><td colspan="2">Matter and Its Interactions
Structure and Properties of Matter
Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.</td></tr>
<tr><td colspan="2"><u>Expectation Unwrapped</u>

[Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.]

<u>SCIENCE AND ENGINEERING PRACTICES</u>
Analyzing and Interpreting Data
• Analyze data from tests of an object or tool to determine if it works as intended.

<u>DISCIPLINARY CORE IDEAS</u>
Structures and Properties of Matter
• Different properties are suited to different purposes.

<u>CROSSCUTTING CONCEPTS</u>
Cause and Effect
• Simple tests can be designed to gather evidence to support or refute student ideas about causes.

<u>ENGINEERING DESIGN</u>
• Refer to Engineering, Technology, and Application of Science 2.ETS1A.1</td><td><u>DOK Ceiling</u>
3

<u>Item Format</u>
Selected Response
Constructed Response
Technology Enhanced</td></tr>
<tr><td colspan="2"><u>Content Limits/Assessment Boundaries</u>

• Assessment of quantitative measurements is limited to length using nonstandard measurement unless standard measurement has been taught.
• Allow students to contribute to the materials being evaluated and the number of tests being run.</td><td><u>Sample Stems</u></td></tr>
</table>

Grade 2 SCIENCE

Possible Evidence

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.
- Using graphical displays (e.g., picture charts, grade-appropriate graphs); using the given data from tests of different materials to organize those materials by their properties (e.g., strength, flexibility, hardness, texture, and ability to absorb).
- Build on prior experiences and progress to collect, record, and share observations.
- Students use their organized data to support or refute their ideas about which properties of materials make the object or tool best suited for the intended purpose relative to the other given objects/tools.
- Students describe how the given data from the tests provide evidence of the suitablity of different materials for the intended purpose.
- Students identify and describe relationships between properties of materials and some potential uses for the intended purpose (e.g., roughness is good for keeping objects in place; flexibility is good for keeping materials from breaking, but not good for keeping materials rigidly in place).

ELA Connections

- Describe how reasons support specific points the author makes in a text.
- Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report, record science observations).
- Recall information from experiences or gather information from provided sources to answer a question.

Mathematics Connections

- Draw a picture graph or a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a graph.

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Grade 2 SCIENCE

Physical Sciences	2.PS2.A.1
Core Idea	**Motion and Stability: Forces and Interactions**
Component	**Forces and Motion**
MLS	Analyze data to determine how the motion of an object changed by an applied force or the mass of an object.

Expectation Unwrapped

[Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools, such as a ramp, to increase the speed of the object, and a structure that would cause an object such as a marble or ball to turn.]

SCIENCE AND ENGINEERING PRACTICES

Analyzing and Interpreting Data

- Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.
- Analyze data from tests of an object or tool to determine whether it works as intended.

DISCIPLINARY CORE IDEAS

Motion and Stability: Forces and Interactions

- Pushes and pulls can have different strengths and directions.
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop the object.

CROSSCUTTING CONCEPTS

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

ENGINEERING DESIGN

- Refer to Engineering, Technology, and Application of Science 2.ETS1A.1

DOK Ceiling

3

Item Format

Selected Response
Constructed Response
Technology Enhanced

Grade 2 SCIENCE

Content Limits/Assessment Boundaries

- Assessment does not include friction as a mechanism for change in speed.
- Mass and weight are not distinguished in second grade. Do NOT assess mass.
- Qualitative observations are used to determine how adding a heavier or lighter object changes the motion of an object.

Possible Evidence

- Students organize given information using graphical or visual displays (e.g., pictures, pictographs, drawings, written observations, tables, charts).
  - Identify that pushes and pulls can have different strengths and directions.
  - Identify that pushes or pulls on an object can change the speed or direction of its motion and can start or stop the object.

ELA Connections

- Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
- Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence).
- Conduct short research projects that build knowledge about a topic.
- Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Sample Stems

Grade 2 SCIENCE

Physical Sciences	2.PS4.A.1
Core Idea	**Waves and their Applications in Technologies for Information Transfer**
Component	**Wave Properties**
MLS	Plan and conduct investigations to provide evidence that changes in vibration create changes in sound.

Expectation Unwrapped

SCIENCE AND ENGINEERING PRACTICES

Plan and conduct Investigations

- Collaboratively investigate how vibrations can be changed to create different sounds (pitch) and loudness (volume).

DISCIPLINARY CORE IDEAS

Wave Properties

- Sound can make material (matter) vibrate, and vibrating material (matter) can make sound.

CROSSCUTTING CONCEPTS

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

ENGINEERING DESIGN

- Refer to Engineering, Technology, and Application of Science 2.ETS1A.1
- Refer to Engineering, Technology, and Application of Science 2.ETS1B.1

DOK Ceiling

3

Item Format

Selected Response
Constructed Response
Technology Enhanced

Content Limits/Assessment Boundaries

- Do not assess the following terms: *amplitude*, *wavelength*, *pitch*, *volume, and matter.*
- Limit description of sound to relative, qualitative terms (e.g., loud, soft, high, low).

Sample Stems

Grade 2 SCIENCE

Possible Evidence	

• Identify that material (matter) moves back and forth when vibrating.
• Identify that sound can be used to make materials vibrate.
• Identify an object that is vibrating to make sound.
• Given a scenario, the student will do the following:
  ○ Answer questions about the relationship between vibrating materials and sound.
  ○ Describe how to make materials vibrate to make sound.
  ○ Describe how sound can be used to make materials vibrate.	

Stimulus Materials	
Graphic organizers, diagrams, graphs, data tables, drawings	

Grade 2 SCIENCE

Life Sciences	2.LS2.A.1
Core Idea	**Ecosystems: Interactions, Energy, and Dynamics**
Component	**Interdependent Relationships in Ecosystems**
MLS	Plan and conduct investigations on the growth of plants when growing conditions are altered (e.g., dark versus light, water versus no water).

Expectation Unwrapped

SCIENCE AND ENGINEERING PRACTICES

Planning and Conducting an Investigation

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.
- Determine the types of materials needed for the investigation.
- Guide students to determine the parameters for growing conditions.
  - How much water?
  - Where do we put the plants?
  - What is the source of light?
  - What type of seed/plant?
- Collaboratively develop an investigation plan.

DISCIPLINARY CORE IDEAS

Interdependent Relationships in Ecosystems

- Identify basic plant needs.
- Plants depend on water and light to grow.

CROSSCUTTING CONCEPTS

Cause and Effect

- Events have causes that generate observable patterns.

DOK Ceiling

3

Item Format

Selected Response
Constructed Response
Technology Enhanced

Content Limits/Assessment Boundaries

- Tasks should only test one variable at a time.
- Tasks should include only data is qualitative (e.g., green leaves, healthy, and sturdy versus pale, droopy, and withered).
- Tasks should not expect any qualitative data beyond comparison of leaves or general size.

Sample Stems

Grade 2 SCIENCE

Possible Evidence

- Develop and conduct a plan.
- Record and report qualitative data on the plants, comparing growing conditions.
- Identify cause and effect by working with one variable at a time.
- Identify basic plant needs: light and water.
- Present other possible growing conditions to alter, such as soil type or temperature.
- Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record scientific observations).

ELA Connections

- Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).
- Recall information from experiences or gather information from provided sources to answer a question.

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Grade 2 SCIENCE

Life Sciences	2.LS2.A.2
Core Idea	**Ecosystems: Interactions, Energy, and Dynamics**
Component	**Interdependent Relationships in Ecosystems**
MLS	Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.

Expectation Unwrapped

SCIENCE AND ENGINEERING PRACTICES

Developing and Using Models

- Develop a simple model based on evidence to represent a proposed object or tool.
- Develop a simple model to explain the phenomenon of pollination and dispersal of seeds.

DISCIPLINARY CORE IDEAS

Interdependent Relationships in Ecosystems

- Plants depend on animals for pollination or to move their seeds around.
- Understand the importance of animals in their specialized role of pollination or seed dispersal.
- Identify that animals have different structures that perform specific functions for dispersing seeds or pollinating plants (e.g., chipmunk's cheeks for carrying seeds; a hummingbird's long beak for drinking nectar; animal fur for seeds to cling to).

CROSSCUTTING CONCEPTS

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s).

ENGINEERING DESIGN

- Refer to Engineering, Technology, and Application of Science 2.ETS1A.1
- Refer to Engineering, Technology, and Application of Science 2.ETS1B.1

DOK Ceiling

3

Item Format

Selected Response
Constructed Response
Technology Enhanced

Content Limits/Assessment Boundaries

- Tasks may focus on a simple model that represents seed dispersal or pollination.
- Tasks may require students to identify a unique relationship between plants and animals for seed dispersal or pollination.
- Tasks should not include the life cycle of a plant (pollination results in germination, or the structure and function of the reproductive organs of plants).

Sample Stems

Grade 2 SCIENCE

Possible Evidence

- Identify animal structures and describe how they help animals pollinate plants.
- Identify animal structures and describe how they help animals disperse seeds.
- Describe the relationships between the components of the model that allow for movement of pollen or seeds.
- Describe how the structure of the model mimics the animal and gives rise to its function of pollinating or seed dispersal (e.g., bees carry pollen; birds digest and carry seeds).
- Compare two models to identify which model best mimics the function of an animal in pollinating or dispersing seeds.
- Match tools or models to the animal to mimic the function of pollinating or dispersing seeds.
- Draw a model or diagram that mimics an animal in a pollinating or seed-dispersal situation.
- Create a physical model of an animal that mimics pollinating or dispersing seeds (teacher observation—formative or rubric evaluation).

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Grade 2 SCIENCE

<table>
<tr><th colspan="2">Earth and Space Sciences</th><th>2.ESS1.C.1</th></tr>
<tr><td>Core Idea
Component
MLS</td><td colspan="2">Earth’s Place in the Universe
The History of Planet Earth
Use information from several sources to provide evidence that Earth events can occur quickly or slowly.</td></tr>
<tr><td colspan="2"><u>Expectation Unwrapped</u>

[Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.]

<u>SCIENCE AND ENGINEERING PRACTICES</u>
Constructing Explanations and Designing Solutions
• Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
• Make observations from several sources to construct an evidence-based account for natural phenomena.

<u>DISCIPLINARY CORE IDEAS</u>
The History of Planet Earth
• Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe.

<u>CROSSCUTTING CONCEPTS</u>
Stability and Change
• Things may change slowly or rapidly.</td><td><u>DOK Ceiling</u>
3

<u>Item Format</u>
Selected Response
Constructed Response
Technology Enhanced</td></tr>
<tr><td colspan="2"><u>Content Limits/Assessment Boundaries</u>

• Tasks should use examples that are more local in nature in order to be more appropriate for students at this grade level.</td><td><u>Sample Stems</u></td></tr>
</table>

Grade 2 SCIENCE

Possible Evidence

- Students describe evidence from firsthand observations or from media (e.g., books, videos, pictures, historical photos).
  - Some Earth events occur quickly (e.g., the occurrence of flood, severe storms, volcanic eruptions, earthquakes, landslides, and erosion of soil) and the results of those events.
  - Some Earth events occur slowly (e.g., weathering and erosion of rocks) and the results of those events.
  - The relative amount of time it takes for given Earth events to occur (e.g., slowly, quickly, hours, days, years).
  - Students make observations using at least three sources.
  - The occurrence of Earth's events can be observed immediately for quick changes.
  - Observations documented will depend on the Earth event being studied.

ELA Connections

- Ask and answer questions such as who, what, where, when, why, and how, to demonstrate understanding of key details in a text.
- Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.
- With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.
- Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record scientific observations).
- Recall information from experiences or gather information from provided sources to answer a question. Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Grade 2 SCIENCE

Earth and Space Sciences	2.ESS2.A.1
Core Idea	**Earth's Systems**
Component	**Earth Materials and Systems**
MLS	Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

Expectation Unwrapped

[Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.]

SCIENCE AND ENGINEERING PRACTICES

Constructing Explanations and Designing Solutions

- Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.
- Compare multiple solutions to a problem.

DISCIPLINARY CORE IDEAS

Earth Materials and Systems

- Wind and water can change the shape of the land.

CROSSCUTTING CONCEPTS

Stability and Change

- Things may change slowly or rapidly.
- Developing and using technology have impacts on the natural world.
- Connections to Nature of Science.
- Scientists study the natural and material world.

ENGINEERING DESIGN

- Refer to Engineering, Technology, and Application of Science 2.ETS1A.1
- Refer to Engineering, Technology, and Application of Science 2.ETS1B.1

DOK Ceiling

3

Item Format

Selected Response
Constructed Response
Technology Enhanced

Content Limits/Assessment Boundaries

- Tasks should not assess or compare the terms *erosion* or *weathering*.

Sample Stems

Grade 2 SCIENCE

Possible Evidence

- Students describe the given problem, which includes the idea that wind or water can change the shape of the land by washing away soil or sand.
- Students describe at least two given solutions in terms of how they slow or prevent wind or water from changing the shape of the land.
- Students describe the specific, expected, or required features for the solutions that would solve the given problem, such as slowing or preventing wind or water from washing away soil or sand.
- Addressing problems created by both slow and rapid changes in the environment (such as a flood following many mild rainstorms, or a severe storm and flood).
- Students evaluate each given solution against the desired features to determine and describe whether and how well the features are met by each solution.
- Using their evaluation, students compare the given solutions to each other.

ELA Connections

- Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.
- Compare and contrast the most important points presented by two texts on the same topic.

Mathematics Connections

- Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units (e.g., by using drawings--such as drawings of rulers-- or equations with a symbol for the unknown number to represent the problem).

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Grade 2 SCIENCE

<table>
<tr><th colspan="2">Earth and Space Sciences</th><th>2.ESS2.B.1</th></tr>
<tr><td>Core Idea
Component
MLS</td><td colspan="2">Earth’s Systems
Plate Tectonics and Large-Scale System
Develop a model to represent the shapes and kinds of land and bodies of water in an area.</td></tr>
<tr><td colspan="2"><u>Expectation Unwrapped</u>

<u>SCIENCE AND ENGINEERING PRACTICES</u>
Developing and Using Models
• Modeling in K–2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.
• Distinguish between a model and the actual object, process, and/or events the model represents.
• Develop a model to represent patterns in the natural world.

<u>DISCIPLINARY CORE IDEAS</u>
Plate Tectonics and Large-Scale System Interactions
• Maps show where things are located. One can map the shapes and kinds of land and water in any area.

<u>CROSSCUTTING CONCEPTS</u>
Patterns
• Patterns in the natural world can be observed.</td><td><u>DOK Ceiling</u>
3

<u>Item Format</u>
Selected Response
Constructed Response
Technology Enhanced</td></tr>
<tr><td colspan="2"><u>Content Limits/Assessment Boundaries</u>

• Modeling in K–2 must be built on prior knowledge and experiences from the classroom.
• Minor revisions of models are acceptable for K–2.
• Tasks should identify key features of a given model.
• Models should not be limited to a paper/pencil map.
• Maps that are age appropriate contain familiar elements from the local area.</td><td><u>Sample Stems</u></td></tr>
</table>

Grade 2 SCIENCE

Possible Evidence

- Students develop a model (e.g., a map) that identifies the relevant components, including both land and bodies of water in the area.
- In the model, students identify and describe relationships between components using a representation of the specific shapes and kinds of land (e.g., playground, park, hill) and specific bodies of water (e.g., creek, ocean, lake, river) within a given area.
- Students use the model to describe the patterns of water and land in a given area (e.g., an area may have many small bodies of water; an area may have many different kinds of land that come in different shapes)
- Students describe how maps can be used to represent different types of areas (e.g., land, water, mountains).

ELA Connections

- Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.

Mathematics Connections

- Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Grade 2 SCIENCE

<table>
<tr><th colspan="2">Earth and Space Sciences</th><th>2.ESS2.C.1</th></tr>
<tr><td>Core Idea
Component
MLS</td><td colspan="2">Earth’s Systems
The Role of Water in Earth’s Surface Processes
Obtain information to identify where water is found on Earth and that it can be solid or liquid.</td></tr>
<tr><td colspan="2"><u>Expectation Unwrapped</u>

<u>SCIENCE AND ENGINEERING PRACTICES</u>
Obtaining, Evaluating, and Communicating Information
• Obtaining, evaluating, and communicating information in K–2 builds on prior experiences and uses observations and texts to communicate new information.
• Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question.

<u>DISCIPLINARY CORE IDEAS</u>
The Roles of Water in Earth’s Surface Processes
• Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form.

<u>CROSSCUTTING CONCEPTS</u>
Patterns
• Patterns in the natural world can be observed.</td><td><u>DOK Ceiling</u>
3

<u>Item Format</u>
Selected Response
Constructed Response
Technology Enhanced</td></tr>
<tr><td colspan="2"><u>Content Limits/Assessment Boundaries</u>

• Tasks should not include erosion processes.
• Tasks should be limited to where water is found and in what state of matter.
• Tasks should not include the formation of landforms.</td><td><u>Sample Stems</u></td></tr>
</table>

Grade 2 SCIENCE

Possible Evidence

- Students use books and other reliable media as sources for scientific information to accomplish the following:
  - Identify where water is found on Earth, including in oceans, rivers, lakes, and ponds.
  - Describe how water can be found on Earth as liquid water or solid ice (e.g., a frozen pond, liquid pond, frozen lake).
  - Draw conclusions to determine the patterns of where water is found, and in what form.
  - Identify which sources of information are likely to provide scientific information versus opinion.

ELA Connections

- With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.
- Recall information from experiences or gather information from provided sources to answer a question.

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Grade 2 SCIENCE

Engineering, Technology, and Application of Science	2.ETS1.A.1
Core Idea Component MLS	**Engineering Design** **Defining and Delimiting Engineering Problems** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

Expectation Unwrapped

Clarification: Engineering Standards should be ongoing and continually integrated into science lessons/units. The ETS Standards are written as a K-2 grade span end point. Therefore, by the end of grade 2, students should be proficient in these skills. In grade 2, this engineering standard will be most successful when paired with, but not limited to, the following standard:

2.PS1.A.2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

SCIENCE AND ENGINEERING PRACTICES

- Define a simple problem that can be solved through the development of a new or improved object or tool.
- Communicate information or design ideas and/or solutions with others in drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.

CROSSCUTTING CONCEPTS

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.
- Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

ENGINEERING DESIGN

Defining and Delimiting Engineering Problems

- Before beginning to design a solution, one must clearly understand the problem.
- A situation that people want to change or create can be approached as a problem to be solved through engineering.
- Asking questions, making observations, and gathering information are helpful in thinking about problems.

DOK Ceiling

3

Item Format

Selected Response
Constructed Response
Technology Enhanced

Grade 2 SCIENCE

Content Limits/Assessment Boundaries

- Tasks should provide students with a situation or simple problem to be changed or improved.
- Tasks should identify constraints or limitations of the problem to be solved ("rules" may be a more age-appropriate term).
- K–2 tasks must be built on prior knowledge and experiences from the classroom and/or real world.

Possible Evidence

- Students ask questions and make observations to gather information about a situation that people want to change.
- Students' questions, observations, and information-gathering are focused on the following:
    - A given simple situation that needs to change
    - Why a given situation needs to change
    - The desired outcome of changing a situation
- Students' questions are based on observations and information gathered about scientific phenomena that are important to the situation.
- Identify key features of an improved object or tool.
- Evaluate the different products developed in order to identify how it helps to solve the problem.
- Compare the different solutions and match the product to determine whether it solves the problem.

ELA Connections

- Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.
- With guidance and support from adults, use a variety of digital tools to produce and publish writing, while collaborating with peers.
- Recall information from experiences or gather information from provided sources to answer a question.
- Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences, when appropriate to clarify ideas, thoughts, and feelings.

Mathematics Connections

- Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Sample Stems

Grade 2 SCIENCE

Engineering, Technology, and Application of Science	2.ETS1.B1
Core Idea	**Engineering Design**
Component	**Developing Possible Solutions**
MLS	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Expectation Unwrapped

Clarification: Engineering standards should be ongoing and continually integrated into science lessons/units. The ETS Standards are written as a K-2 grade span end point. Therefore, by the end of grade 2, students should be proficient in these skills. In grade 2, this engineering standard will be most successful when paired with, but not limited to, the following standard:

2.LS2.A.2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

SCIENCE AND ENGINEERING PRACTICES

Developing and Using Models

- Modeling in K–2 builds on prior experiences and progresses to include using and developing models (e.g., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.
- Develop a simple model based on evidence to represent a proposed object or tool.

CROSSCUTTING CONCEPTS

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s).

ENGINEERING DESIGN SOLUTIONS

Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's possible solutions to other people.

DOK Ceiling

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Item Format

Selected Response
Constructed Response
Technology Enhanced

Grade 2 SCIENCE

Content Limits/Assessment Boundaries

- Tasks should provide students with a scenario or simple problem to be solved.
- Tasks should identify constraints or limitations of the problem to be solved.
- Modeling in K–2 must be built on prior knowledge and experiences from the classroom.
- Revising models is not appropriate for K–2.
- Tasks should identify key features of a given model.

Possible Evidence

- Develop a representation of an object and the problem it is intended to solve (formative/rubric).
- Identify structures and describe how they perform a function to solve a given problem.
- Describe the relationships between the components of the model that allow the problem to be solved.
- Describe how the structure of the model gives rise to the function of specific components.
- Evaluate drawings, sketches, or models to pair structures with corresponding functions.
- Draw or diagram a model that demonstrates a solution to a problem.
- Create a physical model (formative/rubric).
- Given a scenario, develop a simple model to explain the relationship of structure and function.
- Compare models to identify common features and differences.
- Collaboratively (with guidance or group work) or independently develop and/or use a model that represents amounts, relationships, relative scales (bigger or smaller), and/or patterns in the natural and designed world(s).
- Collaboratively (with guidance or group work) develop a simple model based on evidence to represent a proposed object or tool.

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Sample Stems

Grade 2 SCIENCE

Engineering, Technology, and Application of Science	2.ETS1.C.1
Core Idea	**Engineering Design**
Component	**Optimizing the Solution Process**
MLS	Analyze data from tests of two objects designed to solve the same problem to compare the strength and weaknesses of how each performs.

Expectation Unwrapped

Clarification: Engineering standards should be ongoing and continually integrated into science lessons/units. The ETS Standards are written as a K-2 grade span end point. Therefore, by the end of grade 2, students should be proficient in these skills. In grade 2, this engineering standard will be most successful when paired with, but not limited to, the following standard:

2.ESS2.A.1: Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.

SCIENCE AND ENGINEERING PRACTICES

Analyze Data

- Analyze data from tests of an object or tool to determine if it works as intended.
- Record information (observations, thoughts, and ideas).
- Use and share pictures, drawings, and/or writings of observations.
- Compare predictions (based on prior experiences) to what occurred (observable events).

CROSSCUTTING CONCEPTS

Cause and Effect

- Simple tests can be designed to gather evidence to support or to refute student ideas about causes.

Structure and Function

- The shape and stability of structures and designed objects are related to their function(s).

ENGINEERING DESIGN

Optimizing the Design Solution

- Because there is always more than one possible solution to a problem, it is useful to compare and test designs.

DOK Ceiling

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Item Format

Selected Response
Constructed Response
Technology Enhanced

Grade 2 SCIENCE

Content Limits/Assessment Boundaries

- K–2 tasks must be built on prior knowledge and experiences from the classroom and/or real world.
- Tasks must be conducted by the test group.
- Students must analyze data that they collected, not information from another source.
- Students are not required to do this standard independently.

Possible Evidence

- With guidance, students use graphical displays (e.g., tables, pictographs, line plots) to organize given data from tests of two objects, including data about the features and relative performance of each solution.
- Students use their organization of the data to find patterns in the data, including the following:
  - How each of the objects performed, relative to the other object and the intended performance
  - How various features (e.g., shape, thickness) of the objects relate to their performance (e.g., speed, strength)
- Students use the patterns they found in object performance to describe the following:
  - The way (e.g., physical process, qualities of the solution) each object will solve the problem
  - The strengths and weaknesses of each design
  - Which object is better suited to the desired function, if both solve the problem

ELA Connections

- With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.
- Recall information from experiences or gather information from provided sources to answer a question.

Mathematics Connections

- Draw a picture graph or a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a graph.

Stimulus Materials

Graphic organizers, diagrams, graphs, data tables, drawings

Sample Stems